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IS 11328 (1985): Specification for Self-contained Automatic Ice Makers [MED 3: Refrigeration and Air Conditioning]

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IS : 11328 - 1985

(Reaffirmed 2001)

Indian Standard

SPECIFICATION FOR SELF-CONTAINED AUTOMATIC ICE MAKERS

1. Scope — Covers nominal capacity, general constructional requirements, and methods for establishings rating and testing of self-contained ice makers operated by vapour compression type refrigerating machines.

2. Terminology

2.1 *Self-contained Automatic Ice Maker* — A completely factory made and tested assembly (not necessarily shipped as one package) to which no refrigerant containing parts are connected in the field, consisting of a condensing unit and ice making section with means for automatically manufacturing and harvesting ice in cubes, flake or any other readily usable form with or without provision for storage or means for dispensing ice.

2.1.1 These requirements do not apply to the ice makers of the tray type, ice vending machines or the ice makers and ice maker kits used in household refrigerators and freezers.

2.2 *Condensing Unit* — The part of refrigerating system which condenses the evaporated gas back to liquid form, mainly comprises a power driven compressor, a condenser, a drier and a receiver, if necessary.

2.3 *Evaporator* — The part of the refrigerating system where liquid refrigerant evaporates and in doing so absorbs heat.

2.4 *Refrigeration Compressor* — The machine consisting of an electrically driven refrigerant pump housed in a container which is welded or brazed together to form a gas tight shell. The machine cannot be taken apart without cutting open the container housing and has no access to internal moving parts. The electrical windings are exposed to both the refrigerant and the compressor lubricating oil.

2.5 *Hermetically Sealed System* — A hermetically sealed system comprises a hermetically sealed compressor unit, a condenser, an expansion device and an evaporator with other accessories such as receiver, drier, etc, permanently connected. All the gas tight connections in the refrigerating system shall be welded, brazed or silver soldered. If necessary, flare connections shall be allowed.

2.6 *Accessory* — A device or component intended for installation in or connection to an ice maker for the purpose of modifying or supplementing its function. It is intended for installation in the field by the serviceman or other equally qualified person.

2.7 *Batch Cycle Ice Maker* — A unit intended to programme the freezing and harvesting cycle by means of present automatic controls.

2.8 *Continuous Cycle Ice Maker* — A unit intended to harvest ice while operating in a constant freezing cycle.

2.9 *Electrical Grid* — A hot wire assembly designed to cut slab ice into cubical and similar shapes.

2.10 *Harvest Cycle* — The periodic function of removing or separating the manufactured ice from the evaporator.

Adopted 25 June 1985

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INDIAN STANDARDS INSTITUTION
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NEW DELHI 110002

Refrigeration and Air Conditioning Sectional Committee, EDC 66; Air Conditioning and Refrigeration Appliances and Commercial Refrigerators, Subcommittee, EDC 66 : 1 [Ref : Doc : EDC 66 (3685)]

3. Construction

3.1 The chassis shall be of rigid construction so as to withstand the manual use and the panel shall be made of steel members and coated with anti-rust compound. The panel of the unit shall be of suitable materials, such as stainless steel, mild steel sheets, galvanized steel sheets, aluminium, plastic or decorative laminates, having adequate thickness and suitably protected against the corrosion to give long life under conditions of use. It shall be made for easy assembly, replaceability and handling.

3.2 The inflow, drain and overflow connections shall be accessible so as to facilitate easy connection at the time of installation. The refrigerant used shall be odourless, non-irritating, non-toxic non-inflammable, non-explosive and non-corrosive.

3.3 The materials used in the construction of the cabinet shall be free from defects which are likely to cause undue deterioration or failure. The shell shall not shrink, warp or cause smell or odour and shall be resistant to attack by local vermines and destructive pests. All the materials used shall not lose in service any of their essential properties (such as adhesion, plasticity and moisture, resistance) due to temperature and humidity variations.

3.4 The internal finish shall be durable and capable of being cleaned effectively and hygenically without any adverse effect.

3.5 The condensing unit shall be mounted in a way as not to transmit undue vibrations to the cabinet and shall be reasonably quiet in operation.

3.6 The refrigerating system shall be assembled in accordance with good engineering practice with regard to reliability, durability and adequacy of unit to give the desired results.

4. General Requirements

4.1 *Rating* — The ice makers shall be rated under the conditions specified below for the production of ice in 24 hours.

Ambient temperature : 32°C
Ingoing water temperature : 25°C

4.1.1 Table or graph indicating ice production capacity at different water and ambient temperatures shall also be made available by the manufacturers on demand/upon request.

4.2 *Water Connections* — Where the static head is more than 10 metres, a suitable pressure reducing device shall be provided at the time of installation.

4.3 *Electrical Cord* — The power cable, if provided, shall conform to IS : 694-1977 'PVC insulated cables for working voltages up to and including 1 100 volts (*second revision*)' and minimum length shall be 1·5 metres.

4.4 *Electrical Grids*

4.4.1 An electric grid, if provided, shall be supplied from a low energy circuit, unless it can be determined that the grid circuit will not create a shock or fire hazard under abnormal service conditions.

4.4.2 Electric grid shall be substantially constructed. It shall be insulated from non-current carrying metal parts which will withstand moisture and shall be capable of withstanding the dielectric strength when wetted after the harvest cycle.

4.4.3 Electric grid including the interconnecting wiring shall be separated from low voltage parts of wiring.

5. Tests

5.1 *Type Test* — The following shall constitute the type test:

a) Insulation resistance test,
b) High voltage test,
c) Ice making capacity rating test,
d) Maximum operating condition test, and
e) Pressure test or leakage test.

5.1.1 Once an ice maker has undergone type test, any major alteration affecting the performance which the manufacturer intends to make, shall be reported to the inspecting authority and further type test shall be carried out in the modified ice maker in accordance with the procedure laid down in the standard.

5.2 *Production Routine Tests* — Every ice maker after completion shall be subjected to the following routine tests at the manufacturers end:

a) Insulation resistance test,

b) General running test, and

c) High voltage test.

5.3 *Acceptance Test* — If the manufacturer desires any of the production routine test to be repeated at the time of purchase, then where agreed to between the purchaser and the manufacturer, the test may be carried out at the manufacturers works.

5.4 *Sample for Tests*

5.4.1 *Type test* — Two ice makers of each type and size shall be sent alongwith manufacturers' detailed specifications to the appropriate inspecting authority.

5.4.2 *Acceptance test* — The number of samples shall be as agreed to between the purchaser and the manufacturer.

5.4.3 *Preparation and test conditions* — Each specimen tested shall be selected from stock or routine factory production and shall be representative of construction and adjustment.

The ice maker shall be operated until stable operating conditions are reached before starting the test.

5.5 *Procedure for the Type Test*

5.5.1 *Pressure test and leakage tests* — No part of the assembly under test shall show signs of refrigerant leakage under normal working pressure when tested.

The minimum test pressure shall be as given below:

a) *High pressure side* — The saturation vapour pressure of the refrigerant at 75°C.

b) *Low pressure side* — The saturation vapour pressure of the refrigerant at 50°C.

5.5.2 *Insulation resistance test* — The insulation resistance between all the electrical circuits and earthed metal parts when measured at normal room temperature at the manufacturers' works with a voltage of 500 V, D.C. shall not be less than one mega ohm after the unit has run for six hours. This test shall be done after high voltage test.

5.5.3 *High voltage test* — The electrical insulation of all electrical circuits (low voltage circuit not included) shall be such as to withstand high voltage test of 1 000 V, rms applied for approximately 2 seconds between all electric circuit and all accessible metal parts. The test voltage shall be alternating of approximately sine wave form and of any convenient frequency between 25 and 100 Hz.

5.5.4 *Ice making capacity rating test*

5.5.4.1 The objective of this test is to determine the ice production capacity of a specimen ice maker under fixed conditions. The following measurements shall be done:

a) Temperature of in-going water,

b) Quantity of ice produced in each batch,

c) Starting time of cycle,

d) Time of completion of cycle,

e) Ambient temperature,

f) Voltage at service connections when the machine is working,

g) Power consumption of the unit, and

h) Current taken by the unit.

5.5.4.2 The ambient temperature shall be maintained within ± 1°C of the specified temperature and shall be measured at points located 25 cm from the sides other than the sides in which condenser outlet is located.

5.5.4.3 Inlet water temperature shall be adjusted to within ± 0·5°C throughout the test. Minimum 6 readings should be recorded after steady state has reached.

5.5.4.4 Evaluation of ice making capacity rating test results:

a) The ice making capacity of the ice maker tested shall be the average of 6 readings recorded.

b) The test report shall contain the measurement of items prescribed in **5.5.4.1** after specified rating conditions have become established.

c) Type test report shall contain the following identification data:
   1) Name plate — data of ice maker,
   2) Name plate — data of compressor,
   3) Fan motor name plate data, and
   4) Pump motor name plate data.

5.6 *Test Procedure for Production Routine Test*

5.6.1 *Insulation resistance test* — This shall be as per details given under **5.5.2**.

5.6.2 *General running test* — Measurement shall be made of the following under prevailing ambient conditions and performance figures shall be compared with the unit which has already passed the type test.

a) Temperature of in-going water,

b) Ambient temperature,

c) Ice making capacity,

d) Voltage at motor service connections, and

e) Power consumption and current.

5.6.3 *High voltage test* — This shall be as given under **5.5.3**.

5.7 *General Requirements for Tests*

5.7.1 *Test conditions* — The ice maker machine shall be so placed or shielded to prevent direct radiation from any heating equipment or other source of hot air circulations in the room and shall be such that there is a uniformity in the temperature distribution without a direct draught upon the ice making machine. Under the test, air movement in the room shall not exceed 15 m/min. The ice making machine shall be placed on a wooden platform with soild top preferably in a central position.

Covers of the ice making machine shall be kept covered during all the tests.

5.7.2 *Temperatures*

5.7.2.1 *Ambient temperature*

a) Ambient temperature shall be maintained within ± 1°C of the specified value, and shall be measured at points located at 1 m from the floor and 0·25 m from the sides. This condition shall be maintained during both stabilizing and test periods.

b) The vertical temperature gradient from the floor to a height of 2 m shall not exceed 1·5°C for each metre of vertical distance.

5.8 *Instruments and Measurements*

5.8.1 The instruments used for measuring shall be calibrated against a secondary standard before making each test or series of tests.

5.8.2 Temperature measurements shall be made with one or more of the following instruments. The minimum division that can be recorded shall be 0·5°C.

a) Mercury in glass thermometer;

b) Thermocouples; and

c) Electric resistance thermometers.

5.8.3 Pressure measurements, when taken shall be made with Bourdon gauge, the accuracy of measurement for suction pressure (absolute) and other pressure (absolute) being ± 75 gf/cm^2 and ± 5 gf/cm^2 respectively.

5.8.4 Watt-hour meter shall be capable of being recorded up to 0·1 kWh. The operating time of the unit shall be obtained by means of a recording meter of a self-starting synchronous electric clock.

5.9 *Ice Weighing Instrument* — Unless otherwise specified, ice made by the unit shall be weighed on an accurate weighing balance, of accuracy ±1 percent of quantity measured.

6. Instructions — An ice maker shall be provided with installation and operating instructions. The instructions shall contain such directions and information as deemed by the manufacturer to be necessary for safe installation, maintenance and use of the device.

7. Manufacturer's Guarantee

7.1 The manufacturer shall give a guarantee for the soundness of construction and performance of the ice making machine and shall be responsible for setting right any manufacturing defects free of charge for a period of 12 months from the date of sale, to the original purchaser or date of inspection or approval in the case of government and semi-government organizations, it being understood that such repairs or replacement of defective parts shall be carried out at the manufacturers works.

7.1.1 The ice produced shall be clear and not opaque and shall have no air entrapments.

8. Marking and Information

8.1 Each self-contained ice maker shall have the following information marked in a permanent and legible manner in a location where it is easily accessible and easily visible after installations.

a) Name plate data of ice maker including, make, model, Sl No., and the name and quantity of refrigerent.
b) Voltages, nominal watts, maximum current and frequency.
c) Ice making capacity.

8.1.1 *ISI certification marking* — Details available with the Indian Standards Institution.

EXPLANATORY NOTE

There are basically four types of technologies to produce ice cubes which are being used all over the world.

These technologies are:

a) Tube ice machines,
b) Phillips system using a plate evaporator that produces a block of ice which is then cut into cubes,
c) Scotsman system which employs an inverted cup evaporator and a spray system, and
d) Wave technique.

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